PLASTIC CONTAINER AND METHOD OF INTEGRALLY SECURING A NECK ATTACHMENT THERETO

The present invention is directed to manufacture of containers, and more particularly to the manufacture of plastic containers having components, such as finish rings and handles, assembled thereto.

Background and Summary of the Invention

Containers for flowable products, such as liquids and granular products, have been formed of plastic by a variety of methods. For example, plastic containers have been blow molded from preforms to provide container bodies having integral neck finishes and handles. Also, plastic containers have been formed with a container body, including a neck finish integral with the container body, and a handle separately attached to the container. Other containers have been formed by positioning an injected molded handle and finish in a blow mold so that the handle and finish are incorporated into the container as it is blow molded.

In at least some instances, it may be desirable to form a container body separately from a neck finish and/or handle. One reason is that a neck finish that is integrally formed with a preform typically requires more accurate and stable dimensioning than the rest of body of the preform, which may limit the cycle time of the preform molding process. Another reason is that the blow molds used to form the container body can be more simple in design in that they do not require pockets to form or hold an integrally molded handle. It may also be desirable to use a different plastic material for strength, color, esthetics or cost issues, for example, wherein the handle and finish need not be made of the same material as the container body.

The invention includes a number of different aspects, which may be implemented separately from or, more preferably, in combination with each other.

A method in accordance with one aspect of the invention includes the steps of providing a container having a neck, providing a container attachment having a circumferentially continuous ring, telescoping the ring over the neck, and radially expanding the neck to secure the attachment to the neck.

In accordance with a second aspect of the invention, there is provided a method of making a handled container that includes the steps of providing a container having a neck, providing a handle having a circumferentially continuous ring, telescoping the ring externally over the neck, and radially expanding the neck to secure the handle to the neck.

In accordance with a third aspect of the invention, there is provided a method of making a handled container that includes the steps of pressure molding a preform having a body and a neck with at least one external engagement element, providing a handle having a circumferentially continuous attachment ring, blow molding the body of the preform to form the body of a container having the neck extending therefrom. Either prior to or subsequent to the blow molding step, the method further includes telescoping the ring of the handle over the neck of the container until the ring is adjacent to the at least one external engagement element, and then expanding at least a portion of the neck containing the at least one external engagement element radially outwardly into engagement with the ring to secure the handle to the neck.

In accordance with a fourth aspect of the invention, there is provided a container that includes a body, a neck extending from the body, and an attachment that includes an attachment ring encircling a portion of the neck, the portion of the neck being strain hardened by radial expansion against an inside diameter of the ring.

In accordance with a fifth aspect of the invention, there is provided an attachment for a container having a body and a neck extending from the body wherein the neck includes a pair of external engagement beads, the attachment includes a ring having an internal diametrical surface having at least one anti-rotational engagement feature, wherein the attachment is adapted for securement to the neck of the container between the pair of external engagement beads and further wherein the pair of external engagement beads axially restrain the ring and the at least one anti-rotational engagement feature rotationally restrains the ring from movement relative to the container.

Brief Description of the Drawings

The invention, together with additional objects, features, advantages and aspects thereof, will be best understood from the following description, the appended claims and the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of a preform for use with a method according to one exemplary embodiment of the present invention;

FIG. 2 is an elevational view of a container blow-molded from the preform of FIG. 1 and for use with a method according to one exemplary embodiment of the present invention;

FIG. 3 is a fragmentary schematic illustration of a container assembly being produced from a separate finish ring attachment and the container of FIG. 2, according to an exemplary embodiment of the present invention;

FIG. 4 is a fragmentary schematic illustration of a container assembly being produced from a separate, integrated finish ring and handle attachment and the container of FIG. 2, according to an exemplary embodiment of the present invention;

FIG. 5 is an elevational view of a partially assembled version of the container assembly of FIG. 3, which illustrates a method step according to an exemplary embodiment of the present invention;

FIG. 5A is a cross-sectional view taken along line A-A of FIG. 5, after the method step is complete, wherein a neck of the container is radially expanded into engagement with an attachment such that the attachment is integrally secured to the neck;

FIG. 6 is an elevational view that illustrates a method step for integrally attaching a handle to a container according to another exemplary embodiment of the present invention;

FIG. 7 is an elevational view that illustrates another method step for integrally attaching the handle of FIG. 6 to the container of FIG. 6 according to another exemplary embodiment of the present invention;

FIG. 7A is a cross-sectional view of the completed container assembly of FIG. 7 taken along line A-A thereof; and

FIG. 8 is an elevational view that illustrates a method step for integrally attaching a handle to a container having a neck portion that is narrower at one end than at a finish end, according to yet another exemplary embodiment of the present invention.

Detailed Description of Preferred Embodiments

FIG. 1 illustrates a preform 10 that includes a closed end 12 and an oppositely disposed open end 14. A body portion 16 extends from the closed end 12 toward the open end 14 and terminates in the form of a neck 18. The neck 18 extends upward from the body portion 16 to include an integral annular support flange 20, further extends upward to include integral first and second orienting beads or rings 22, 24 and terminates at the open end 14. For reasons that will be discussed below, the neck portion 18 of the preform 10, particularly that portion

between the orienting rings 22, 24 inclusive, is preferably provided with knurling surface features. Knurling surface features are defined herein as a pattern of small ridges, beads, or cross-hatches provided on a surface to aid in gripping another surface to be placed in contact therewith. The preform 10 may be of monolayer construction, or may be of multilayer construction having an inner layer of barrier resin, for example, such as ethylene vinyl alcohol (EVOH) and outer layers composed of polyethylene terephthalate (PET) polyethylene naphthalate (PEN) or the like, or any other suitable container materials. The preform 10 may be produced by a pressure molding operation such as injection or compression molding. Subsequently, the preform 10 may be blow molded to form a blow-molded container 110 as shown in FIG. 2.

In FIG. 2, the container 110 shown includes a closed bottom end 112 and the oppositely disposed open end 14. A body portion 116 extends from the closed end 112 toward the open end 14, tapers in the form of a shoulder 117, and terminates in the form of the neck 18. The neck 18 extends upward from the shoulder 117 to include integral annular support flange 20, further extends upward to include integral first and second orienting beads or rings 22, 24 and terminates at the open end 14. Again, via the preform 10 of FIG. 1, knurling features are provided on the neck 18, preferably between the orienting rings 22, 24.

FIG. 3 schematically illustrates a method step in accordance with an exemplary embodiment of the present invention wherein an attachment in the form of a circumferentially continuous finish ring 126 is telescoped over the neck of the container 110, as directionally depicted by the arrow. In other words, the finish ring 126 and container neck 18 are introduced together lengthwise or axially, with the container neck 18 entering the finish ring 126 as the result of the bringing together or collision of the container 110 and finish ring 126. Preferably, the finish ring 126 is placed over the container neck 18 before the container 110 has cooled off from the blow molding step and, thus, while the container material is still relatively soft. It is

also contemplated that this step could be completed after the container 110 has cooled. The finish ring 126 includes a top surface 128, an oppositely disposed bottom surface 130 parallel to top surface 128, and inner and outer diametrical surfaces 132, 134 extending perpendicularly therebetween. The outer diametrical surface 134 include threads 136 or thread-like features or segments integrally formed thereon. The inner diametrical surface 132 includes annular recesses 138 formed therein, and further preferably includes knurling features disposed between the recesses 138. The finish ring 126 is telescoped over the neck 18 until the bottom surface 130 of the finish ring 126 contacts a top surface 142 of the support flange 120. The finish ring 126 may be injection or compression molded and composed of any desired material, particularly any material that is different from the material composition of the preform and container. In other words, the material and conditions of fabrication of the finish ring 126 may be selected separately from the material and fabrication conditions of the preform to achieve more optimal operating characteristics of the finish area of the container 110. Thus, the preform and container 110 can be molded with relatively thinner wall sections without having to accommodate the flow of molten plastic material into a relatively thicker finish area, which reduces material cost and mold cycle time. Preferably, however, the finish ring 126 is composed of polypropylene (PP) or the like, or any other plastic material having sufficient resiliency to elastically expand and retract.

A finish ring 226 shown in FIG. 4 is identical to the finish ring 126 of FIG. 3, except the finish ring 226 of FIG. 4 is provided with an integrally extending handle 244 extending from a bottom surface 230 (or any other surface). Stated another way, the handle 244 has a circumferentially continuous member integrally attached thereto. In any case, the finish ring 226 is telescoped over the neck 18 of the container 110, as described previously.

FIG. 5 schematically depicts a securing step of a method of an exemplary embodiment of the present invention, wherein a mandrel or anvil A is inserted within the open

end 14 of the container 110. The anvil A, or a plurality of sequential anvils, may be used to stretch neck finishes of different containers to various desired sizes. The anvil A may be a single solid tool as shown, or may be a multipiece expandable tool such as an expanding mandrel or the like. The anvil A is driven into the container 110 such that a tapered surface T of the anvil A first works on the open end 14 and then an outer diameter D of the anvil A works on an inner surface 146 of the neck 118 so as to radially outwardly displace and plastically deform the neck 118 until the first and second rings 22, 24 seat within their respective recesses 138 of the finish ring 126 and the corresponding knurling features of the container neck 18 and the finish ring 126 interengage under compression. Accordingly, at least a portion of the finish ring 126 is axially captured between the rings 22, 24 of the container 110. It is contemplated that the material for the container 110 and finish ring 126 be selected such that motion of the anvil A will significantly plastically deform the neck 118 of the container 110 and merely elastically deform the neck ring 126. Preferably, however, this step is executed while the container 110 is still relatively warm from the preceding preforming and blow molding steps. It is contemplated that the neck 18 of the container 110 could be heated in any manner, to maintain the neck 18 in a relatively soft and flexible state. In any case, the finish ring 126 is not substantially radially expanded during the radial expansion step. The resultant snug, interlocking fit between the rings 122, 124 and the recesses 138 is provided to prevent relative axial movement between the container neck 18 and the finish ring 126. Similarly, the interengagement of the knurling features provides added frictional resistance to rotational movement between the container neck 18 and the finish ring 126.

In FIG. 5A, there is illustrated an additional or alternative feature. FIG. 5A illustrates an assembled version of FIG. 5 taken in the form of a transverse cross-section along line A-A thereof. The finish ring 126 includes a radially extending lug 148 formed on the inner

diametrical surface 132, and the container 110 includes a radially extending pocket 152 formed in the neck 118 and which is adapted for receiving the lug 148 of the finish ring 126. The interlocking lug 148 and pocket 152 are provided to prevent relative rotation between the container 110 and finish ring 126.

FIGS. 6 and 7 illustrate an alternative embodiment of the present invention. A container 310 includes a closed end (not shown) and an oppositely disposed open end 314. A body portion 316 extends from the closed end toward the open end 314, tapers in the form of a shoulder 317, and terminates at a neck 318. The neck 318 extends upward from the shoulder 317 to include a pair of retaining beads or rings 319, extends upward further to include an integral annular support flange 320, further extends upward to include an integral neck finish 321 and terminates at the open end 314. The neck finish 321 includes one or more threads or thread segments 323 thereon for securing a closure member (not shown) to the container 310. An attachment in the form of a handle 326 includes a circumferentially continuous ring 327 having a top surface 328 and an curved stem 329 integrally extending from a bottom surface 330 of the ring 327. The handle 326 may be injection or compression molded and composed of any desired material, including even the same the material composition as the container 310. Preferably, however, the handle 126 is composed of polypropylene (PP) or the like, having sufficient resiliency to elastically expand and retract. The handle 326 is shown being telescoped over the neck 318 of the container 310, as depicted by the directional arrows. In other words, the ring 327 of the handle 326 and the container neck 318 are introduced together lengthwise or axially, with the container neck 318 entering the ring 327. The ring 327 includes an inner diameter 332 that is provided just larger than the outer diametrical size of the support flange 320 such that the ring 327 passes freely thereover. The handle 326 is lowered until the ring 327 is axially located substantially between the retaining rings 319 of the container 310.

FIG. 7 schematically depicts an assembly step of a method of another exemplary embodiment of the present invention, wherein the anvil A is inserted within the open end 314 of the container 310. The anvil A includes a tapered surface T and an outer diameter D that is sized just larger than the internal diameter of the neck 318. The anvil A is driven into the container 310 such that the tapered surface T of the anvil A first works on the open end 314 and then the outer diameter D of the anvil A works on an inner surface (not shown) of the neck 318 so as to radially outwardly displace and plastically deform the neck 318 until the rings 319, by virtue of the radial outward displacement thereof, capture the ring 327 of the handle 326 therebetween. It is contemplated that the materials for the components are selected such that motion of the anvil A will largely plastically deform the neck 318 of the container 310 and largely elastically deform the ring 327 of the handle 326. The snug, entrapping fit of the ring 327 of the handle 326 between the rings 319 of the container 310 is provided to prevent relative axial movement between the container neck 318 and the handle 326. Similarly, the interengagement of the knurling features provides added frictional resistance to rotational movement between the container neck 318 and the handle 326.

In addition, FIG. 7A illustrates an assembled version of FIG. 7 taken in the form of a transverse cross-section along line A-A thereof. In FIG. 7A it can be seen that the ring 327 of the handle 326 includes a radially extending lug 348 formed on the inner diametrical surface 332, and that the container 310 includes a radially extending pocket 352 formed in the neck 318 and adapted for receiving the lug 348 of the ring 327. The interlocking lug 348 and pocket 352 are provided to prevent relative rotation between the container 310 and handle 326.

FIG. 8 depicts another exemplary embodiment of the present invention. A container 410 includes a closed end (not shown) and an oppositely disposed open end 414. A body portion 416 extends from the closed end toward the open end 414, tapers in the form of a

shoulder 417, and terminates in the form of a neck 418. The neck 418 extends forward from the shoulder 417 to include a reduced diameter portion 418' having a pair of retaining rings 419, extends forward further to include an integral annular capping flange 420, further extends forward to include an integral neck finish 421, and terminates at the open end 414. The neck finish 421 includes one or more threads 423 thereon for securing a closure member (not shown) to the container 410. Thus, the container 410 is largely the same as the container 310 shown in FIGS. 6 and 7, except that the neck finish 421 is provided in size as the desired final finish size and thus does not get stretched during the stretching operation, while the neck 418 includes the reduced diameter portion 418' which does get stretched during the stretching operation.

Still referring to FIG. 8, an attachment in the form of a handle 426 includes a circumferentially continuous ring 427 having a top surface 428 and a stem 429 extending from the ring 427. The handle 426 may be injection or compression molded and composed of any desired material, including even the same the material composition as the container 410. Preferably, however, the handle 426 is composed of polypropylene (PP) or the like, having sufficient resiliency to elastically expand and retract. The handle 426 is shown being telescoped over the neck 418 of the container 410, as depicted by the directional arrows. In other words, the ring 427 of the handle 426 and the container neck 418 are introduced together lengthwise or axially, with the container neck 418 entering the ring 427 as the result of collision therebetween. The ring 427 includes an inner diameter 432 that is sized to be just larger than the outer diameter size of the capping flange 420 such that the ring 427 passes freely thereover. The handle 426 is lowered until the ring 427 is axially located substantially between the retaining rings 419 of the container 410.

FIG. 8 also schematically depicts an assembly or securing step of a method of another exemplary embodiment of the present invention, wherein the anvil A is inserted within

the open end 414 of the container 410. In contrast to the previous embodiment of FIG. 7, here the outer diameter D of the anvil A is smaller than the inner diameter of the integral neck finish 421 but is larger than the reduced diameter portion 418'. The anvil A is driven into the container 410 such that the tapered surface T' of the anvil A' first works on the open end 414 and then an outer diameter D' of the anvil A' works on an inner surface (not shown) of the reduced diameter portion 418' of the neck 418 so as to radially outwardly displace and plastically deform the reduced diameter portion 418' of the neck 418 until the rings 419 entrap the ring 427 of the handle 426 therebetween.

Several advantages are provided with one or more of the embodiments of the present invention described above. For example, it is now possible to integrally secure an attachment or component to a neck of a container using the same machine or station that is used to stretch the neck finish to desired size, thereby adding value to a container product without adding capital costs. Simultaneously, the neck size of different preform designs can be produced to a common single diameter and thereafter expanded to a variety of desired sizes, thereby minimizing perso parts. Also, the present invention enables the integral securing of an attachment to a container neck using an integral compression fit, rather than the more cumbersome processes of gluing or swaging. It may also be possible to reduce the cost of container manufacture as a result of higher preform cavitation due to employing a smaller common neck size. Finally, the present invention also provides a simplified method of orienting a finish or handle to a container and minimizes undesired rotation of an attachment relative to a container neck.

There have thus been described a container, an attachment for a container, a method of making a container, and methods of making a handled container that fully satisfy all of the objects and aims previously set forth. The present invention has been disclosed in

conjunction with presently preferred embodiments thereof, and a number of modifications and variations have been discussed. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art in view of the foregoing description. Directional words such as top, bottom, upper, lower, radial, circumferential, and the like are employed by way of description and not limitation. Indeed, the invention is intended to embrace all modifications and variations as fall within the spirit and broad scope of the appended claims.